

Comparator with 1.25% Reference and Adjustable Hysteresis

Features

- 1.5V to 5.5V Operating Range
- 1.5 μ A Typical Supply Current
- \pm 1.25% Voltage Threshold Accuracy
- 10 nA Maximum Input Leakage Current Over Temperature
- 10 μ s Propagation Delay
- Externally Adjustable Hysteresis (MIC841)
- Internal 20 mV Hysteresis (MIC842)
- Output Options:
 - Push-Pull, Active-High
 - Push-Pull, Active-Low
 - Open-Drain, Active-Low
- Open-Drain Output can be Pulled to 6V Regardless of V_{DD}
- Immune to Brief Input Transients
- Teeny 5-Pin SC-70 Package
- 6-Pin 1.6 mm x 1.6 mm TDFN (MIC841)
- 4-Pin 1.2 mm x 1.6 mm TDFN (MIC842)

Applications

- Smartphones
- PDAs
- Precision Battery Monitoring
- Battery Chargers

General Description

The MIC841 and MIC842 are micro-power, precision-voltage comparators with an on-chip voltage reference.

Both devices are intended for voltage monitoring applications. External resistors are used to set the voltage monitor threshold. When the threshold is crossed, the outputs switch polarity.

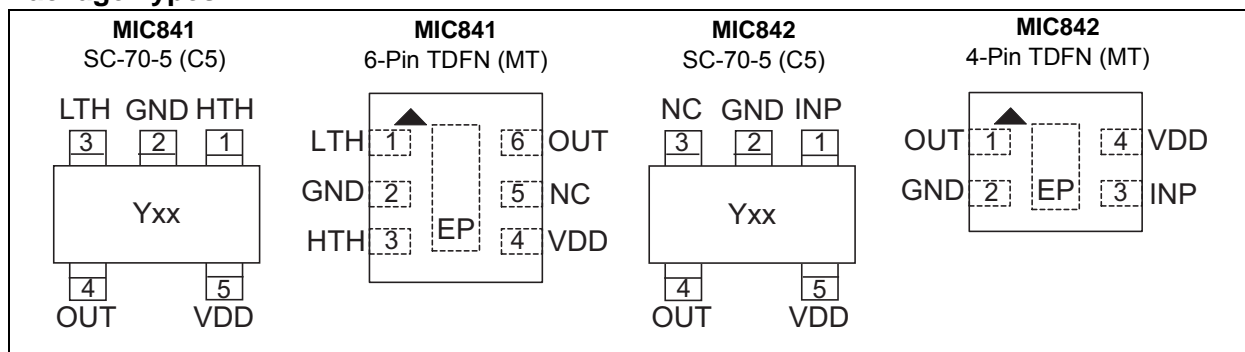
The MIC842 incorporates a voltage reference and comparator with fixed internal hysteresis; two external resistors are used to set the switching threshold voltage. The MIC841 provides a similar function with user adjustable hysteresis; this part requires three external resistors to set the upper and lower thresholds (the difference between the threshold voltages being the hysteresis voltage).

Both the MIC841 and MIC842 are available with push-pull or open-drain output stage. The push-pull output stage is configured either active-high or active-low; the open-drain output stage is only configured active-low.

Supply current is extremely low (1.5 μ A, typical), making it ideal for portable applications.

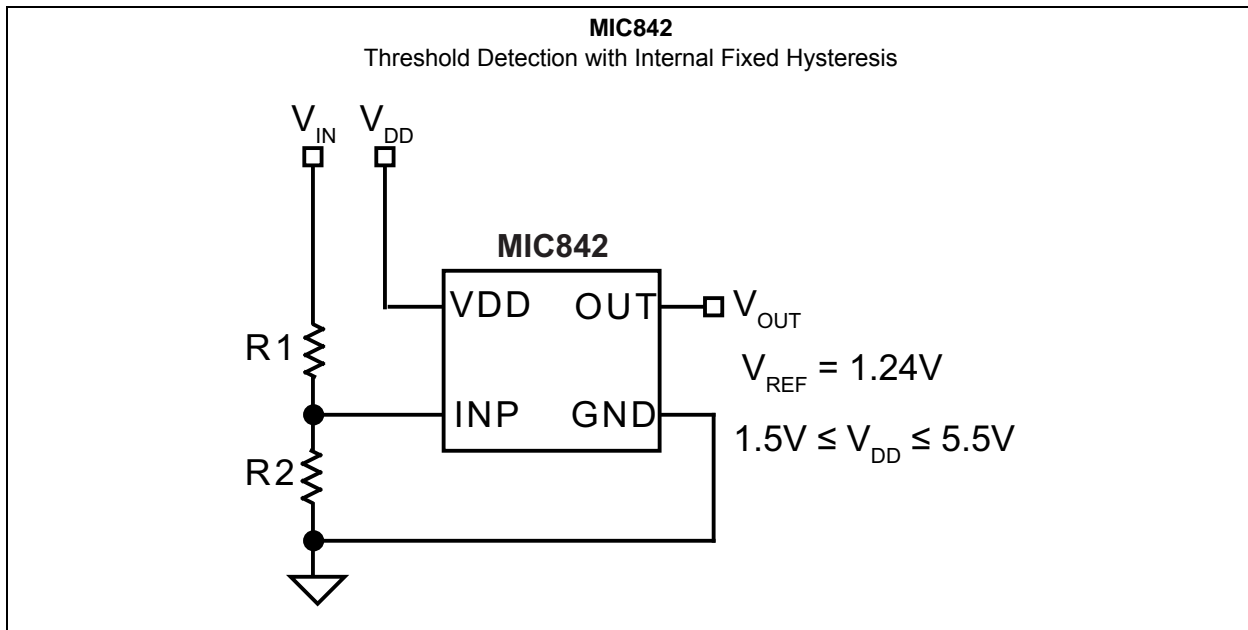
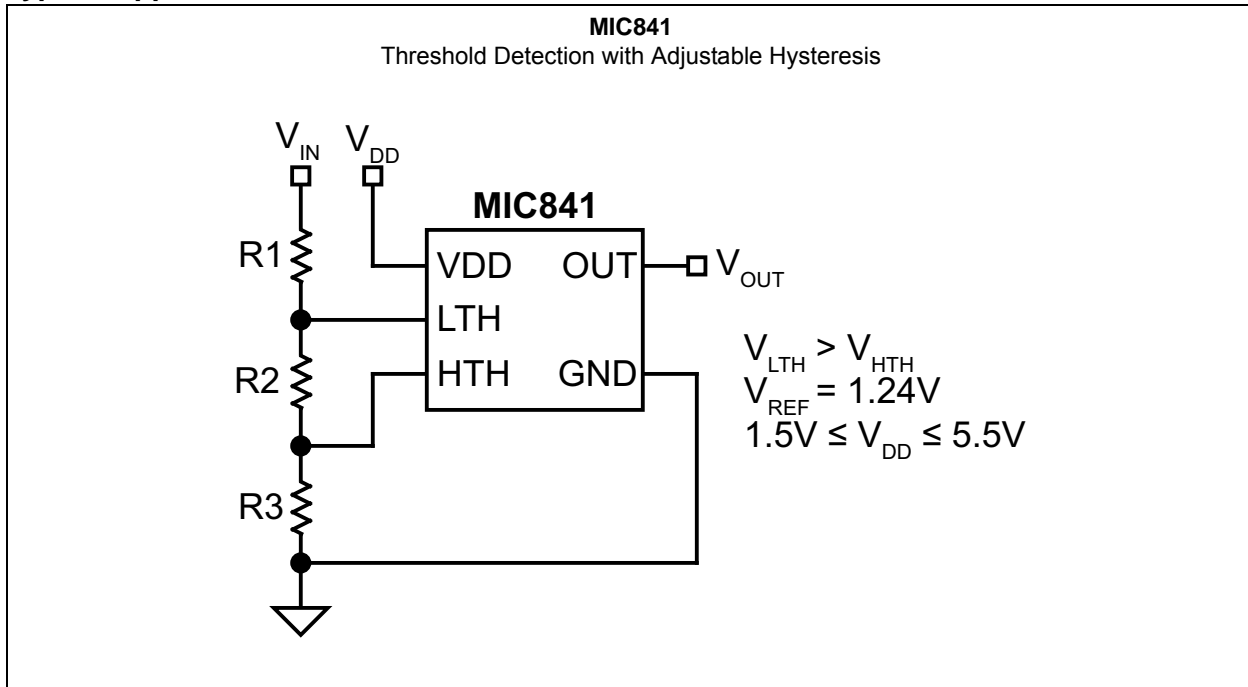
The MIC841/2 is supplied in the Teeny 5-pin SC-70, 6-pin 1.6 mm x 1.6 mm Thin DFN (MIC841), and 4-pin 1.2 mm x 1.6 mm Thin DFN (MIC842) packages.

Package Types



MIC841/2

Typical Application Circuits



1.0 FUNCTIONAL BLOCK DIAGRAMS

Note: Block diagrams show SC-70 package pin numbers.

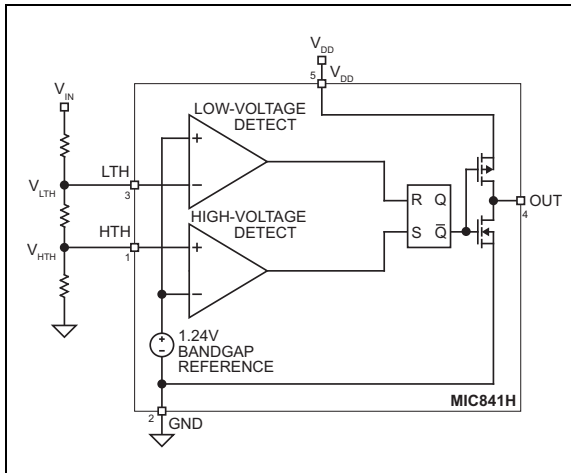


FIGURE 1-1: MIC841H Block Diagram

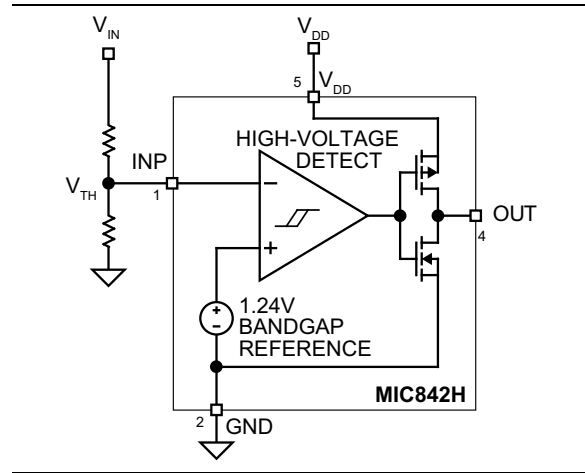


FIGURE 1-4: MIC842H Block Diagram

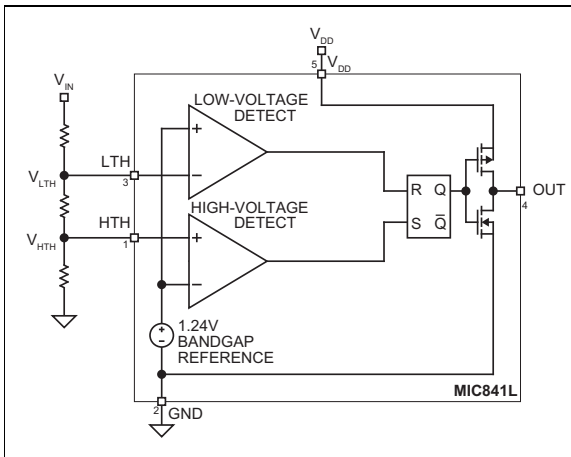


FIGURE 1-2: MIC841L Block Diagram

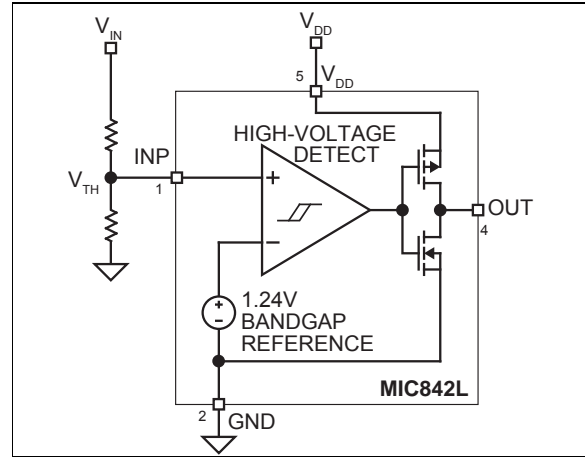


FIGURE 1-5: MIC842L Block Diagram

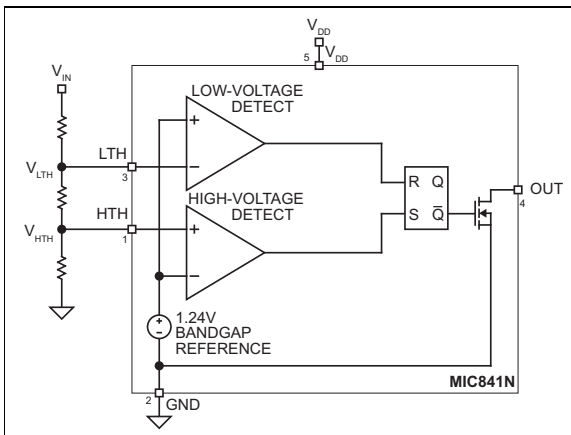


FIGURE 1-3: MIC841N Block Diagram

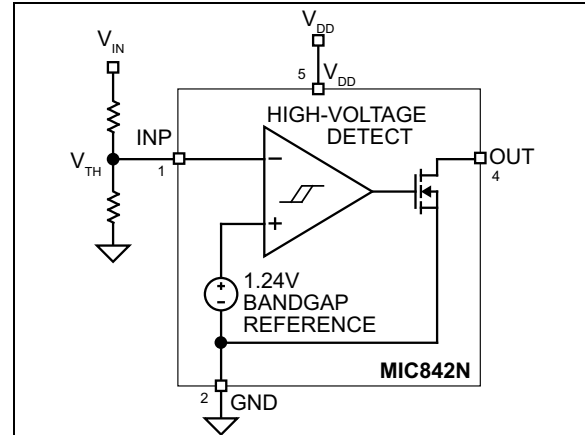


FIGURE 1-6: MIC842N Block Diagram

MIC841/2

2.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage (V_{DD})	-0.3V to +7V
Input Voltage (V_{INP} , V_{LTH} , V_{HTH})	+7V
Output Current (I_{OUT})	±20 mA
ESD Rating ⁽¹⁾	1 kV

Operating Ratings ‡

Supply Voltage (V_{DD})	+1.5V to +5.5V
Input Voltage (V_{INP} , V_{LTH} , V_{HTH})	0V to +6V
V_{OUT} ('H' and 'L' versions)	V_{DD}
V_{OUT} ('N' version)	+6V

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

‡ **Notice:** The device is not guaranteed to function outside its operating ratings.

Note 1: Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5 kΩ in series with 100 pF.

TABLE 2-1: ELECTRICAL CHARACTERISTICS

Electrical Characteristics: $1.5V \leq V_{DD} \leq 5.5V$; $T_A = 25^\circ C$. $-40^\circ C \leq T_A \leq +85^\circ C$, unless noted. (Note 1).					
Parameters	Min.	Typ.	Max.	Units	Conditions
Supply Current (I_{DD})	—	1.5	3	μA	Output not asserted
Input Leakage Current (I_{INP})	—	0.005	10	nA	—
Reference Voltage (V_{REF})	1.225	1.240	1.256	V	$0^\circ C \leq T_A \leq 85^\circ C$
	1.219	1.240	1.261		$-40^\circ C \leq T_A \leq 85^\circ C$
Hysteresis Voltage (V_{HYST}) (Note 2)	8	20	35	mV	MIC842 only
Propagation Delay (t_D)	—	12	50	μs	$V_{INP} = 1.352V$ to $1.128V$
	—	8	50		$V_{INP} = 1.143V$ to $1.367V$
Output Voltage-Low (V_{OUT}) (Note 3)	—	0.05	0.3	V	$I_{SINK} = 1.6$ mA, $V_{DD} \geq 1.6V$
	—	0.005	0.4		$I_{SINK} = 100$ μA , $V_{DD} \geq 1.2V$
Output Voltage-High (V_{OUT}) (Note 3)	—	$0.99V_{DD}$	—		$I_{SOURCE} = 500$ μA , $V_{DD} \geq 1.6V$
	—	$0.99V_{DD}$	—		$I_{SOURCE} = 50$ μA , $V_{DD} \geq 1.2V$

Note 1: Specification for packaged product only.

2: $V_{HTH} = V_{REF} + V_{HYST}$.

3: V_{DD} operating range is 1.5V to 5.5V. Output is guaranteed to be de-asserted down to $V_{DD} = 1.2V$.

MIC841/2

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Maximum Junction Temperature	T_J	—	—	+150	°C	Note 1
Storage Temperature Range	T_S	-65	—	+150	°C	—
Ambient Temperature Range	T_A	-40	—	+85	°C	—
Lead Temperature	—	—	—	+260	°C	Soldering, 10s
Package Thermal Resistances						
SC-70-5	θ_{JA}	—	256.5	—	°C/W	—
6-Pin 1.6 mm x 1.6 mm TDFN	θ_{JA}	—	92	—	°C/W	—
4-Pin 1.2 mm x 1.6 mm TDFN	θ_{JA}	—	173	—	°C/W	—

Note 1: The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A , T_J , θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +150°C rating. Sustained junction temperatures above +150°C can impact the device reliability.

3.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 3-1](#) and [Table 3-2](#).

TABLE 3-1: MIC841 PIN FUNCTION TABLE

Pin Number SC-70	Pin Number TDFN	Symbol	Description
1	3	HTH	High Threshold Input. HTH and LTH monitor external voltages.
2	2	GND	Ground.
3	1	LTH	Low Threshold Input. LTH and HTH monitor external voltages.
4	6	OUT	("H" Version) Active-Low Push-Pull Output. OUT asserts low when $V_{LTH} < V_{REF}$. OUT remains low until $V_{HTH} > V_{REF}$.
		OUT	("L" Version) Active-High Push-Pull Output. OUT asserts high when $V_{LTH} < V_{REF}$. OUT remains high until $V_{HTH} > V_{REF}$.
		OUT	("N" Version) Active-Low, Open-Drain Output. OUT asserts low when $V_{LTH} < V_{REF}$. OUT remains low until $V_{HTH} > V_{REF}$.
5	4	VDD	Power Supply Input.
—	5	NC	No Connect. Not internally connected.
—	EP	ePAD	Heatsink Pad. Connect to GND for best thermal performance.

TABLE 3-2: MIC842 PIN FUNCTION TABLE

Pin Number SC-70	Pin Number TDFN	Symbol	Description
1	3	INP	Threshold Input. INP monitors an external voltage.
2	2	GND	Ground.
3	—	NC	No Connect. Not internally connected.
4	1	OUT	("H" Version) Active-Low, Push-Pull Output. OUT asserts low when $V_{INP} < V_{REF}$. OUT remains low until $V_{INP} > (V_{REF} + V_{HYST})$.
		OUT	("L" Version) Active-High, Push-Pull Output. OUT asserts high when $V_{INP} < V_{REF}$. OUT remains high until $V_{INP} > (V_{REF} + V_{HYST})$.
		OUT	("N" Version) Active-Low, Open-Drain Output. OUT asserts low when $V_{INP} < V_{REF}$. OUT remains low until $V_{INP} > (V_{REF} + V_{HYST})$.
5	4	VDD	Power Supply Input.
—	EP	ePAD	Heatsink Pad. Connect to GND for best thermal performance.

4.0 APPLICATION INFORMATION

4.1 Output

The MIC841N and MIC842N outputs are an open-drain MOSFET, so most applications will require a pull-up resistor. The value of the resistor should not be too large or leakage effects may dominate. 470 kΩ is the maximum recommended value. Note that the output of the “N” version may be pulled up as high as 6V regardless of the IC’s supply voltage. The “H” and “L” versions of the MIC841 and MIC842 have a push-pull output stage with a diode clamped to V_{DD}. Thus, the maximum output voltage of the “H” and “L” versions is V_{DD} (see Table 2-1).

When working with large resistors on the input to the devices, a small amount of leakage current can cause voltage offsets that degrade system accuracy. The maximum recommended total resistance from V_{IN} to ground is 3 MΩ. The accuracy of the resistors can be chosen based upon the accuracy required by the system. The inputs may be subjected to voltages as high as 6V steady-state without adverse effects of any kind regardless of the IC’s supply voltage. This applies even if the supply voltage is zero. This permits the situation in which the IC’s supply is turned off, but voltage is still present on the inputs (see Table 2-1).

4.2 Programming the MIC841 Thresholds

The low-voltage threshold is calculated using Equation 4-1.

EQUATION 4-1:

$$V_{IN(LO)} = V_{REF} \times \left(\frac{R1 + R2 + R3}{R2 + R3} \right)$$

Where:
V_{REF} 1.240V

The high-voltage threshold is calculated using Equation 4-2.

EQUATION 4-2:

$$V_{IN(HI)} = V_{REF} \times \left(\frac{R1 + R2 + R3}{R3} \right)$$

Where:
V_{REF} 1.240V

In order to provide the additional criteria needed to solve for the resistor values, the resistors can be selected such that they have a given total value, that is, R1 + R2 + R3 = R_{TOTAL}. A value such as 1 MΩ for R_{TOTAL} is a reasonable value because it draws minimum current but has no significant effect on accuracy.

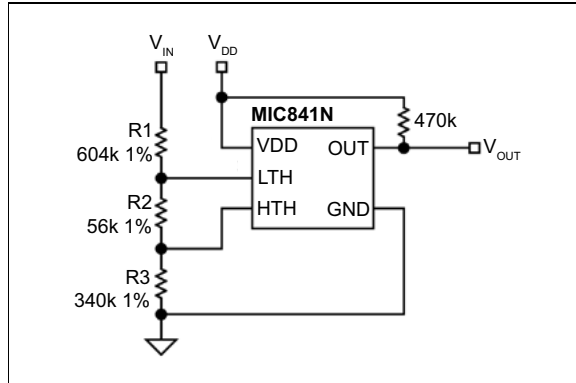


FIGURE 4-1: MIC841 Example Circuit

Once the desired trip points are determined, set the V_{IN(HI)} threshold first.

For example, use a total of 1 MΩ = R1 + R2 + R3. For a typical single-cell lithium ion battery, 3.6V is a good “high threshold” because at 3.6V the battery is moderately charged. Solving for R3:

EQUATION 4-3:

$$V_{IN(HI)} = 3.6V = 1.24V \left(\frac{1M\Omega}{R3} \right)$$

Solve:
R3 344 kΩ

Once R3 is determined, the equation for V_{IN(LO)} can be used to determine R2. A single lithium-ion cell, for example, should not be discharged below 2.5V. Many applications limit the drain to 3.1V.

Using 3.1V for the V_{IN(LO)} threshold allows the calculation of the two remaining resistor values.

EQUATION 4-4:

$$V_{IN(LO)} = 3.1V = 1.24V \left(\frac{1M\Omega}{R2 + 344k\Omega} \right)$$

Solve:
R2 56 kΩ
R1 1 MΩ - R2 - R3
R1 600 kΩ

The accuracy of the resistors can be chosen based upon the accuracy required by the system.

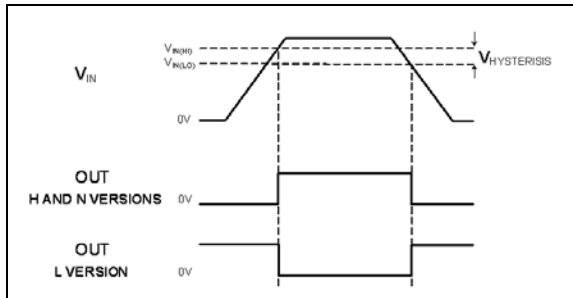


FIGURE 4-2: Output Response and Hysteresis

4.3 Programming the MIC842 Thresholds

The voltage threshold is calculated using [Equation 4-5](#).

EQUATION 4-5:

$$V_{IN(LO)} = V_{REF} \left(\frac{R1 + R2}{R2} \right)$$

Where:

$$V_{REF} = 1.240V$$

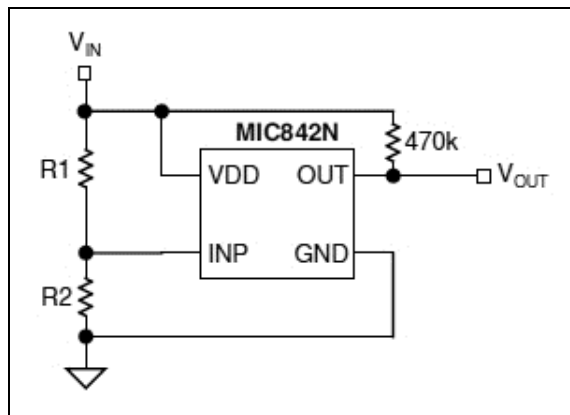


FIGURE 4-3: MIC842 Example Circuit

In order to provide the additional criteria needed to solve for the resistor values, the resistors can be selected such that they have a given total value, that is, $R1 + R2 = R_{TOTAL}$. A value such as 1 M Ω for R_{TOTAL} is a reasonable value because it draws minimum current, but has no significant effect on accuracy.

4.4 Input Transients

The MIC841/2 is inherently immune to very short negative-going “glitches.” Very brief transients may exceed the $V_{IN(LO)}$ threshold without tripping the output.

As shown in [Figure 4-4](#), the narrower the transient, the deeper the threshold overdrive that will be ignored by the MIC841/2. The graph represents the typical allowable transient duration for a given amount of threshold overdrive that will not generate an output.

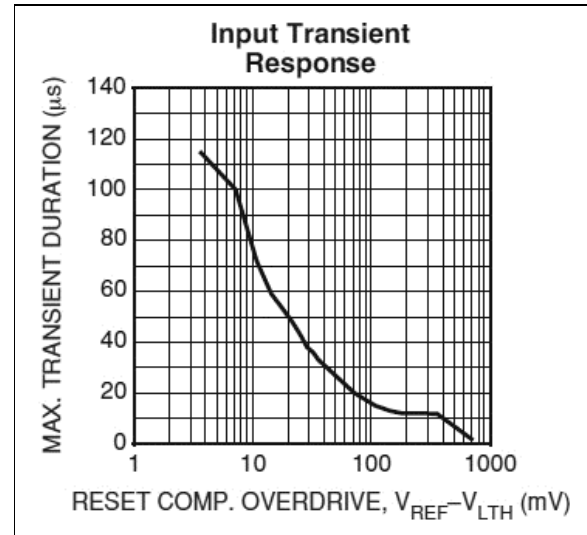


FIGURE 4-4: Input Transient Response

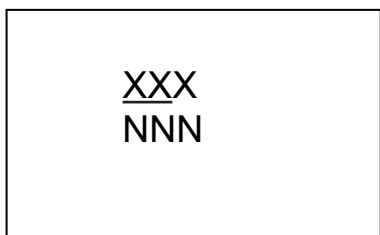
MIC841/2

5.0 PACKAGING INFORMATION

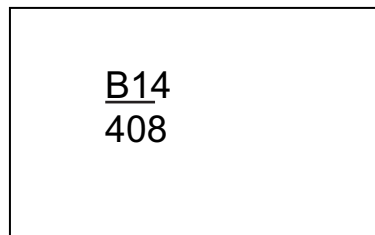
5.1 Package Marking Information

5-Pin SC-70*

Example

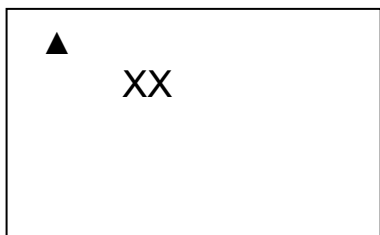


Device	Marking
MIC841H	B13
MIC841L	B14
MIC841N	B15
MIC842H	B16
MIC842L	B17
MIC842N	B18

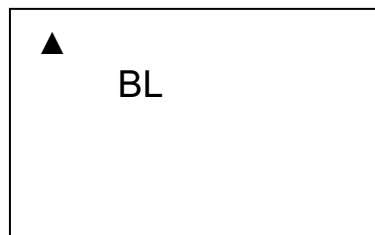


4-Pin TDFN*
6-Pin TDFN*

Example



Device	Marking
MIC841H	BH
MIC841L	BL
MIC841N	BN
MIC842H	HB
MIC842L	HL
MIC842N	HN



Legend: XX...X Product code or customer-specific information
 Y Year code (last digit of calendar year)
 YY Year code (last 2 digits of calendar year)
 WW Week code (week of January 1 is week '01')
 NNN Alphanumeric traceability code
 (e3) Pb-free JEDEC® designator for Matte Tin (Sn)
 * This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
 •, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).

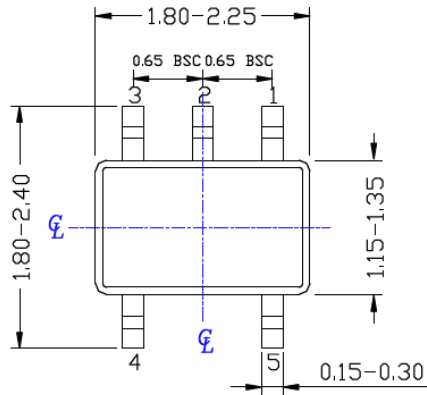
Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.
 Underbar () and/or Overbar () symbol may not be to scale.

5 Lead SC70 Package Outline and Recommended Land Pattern

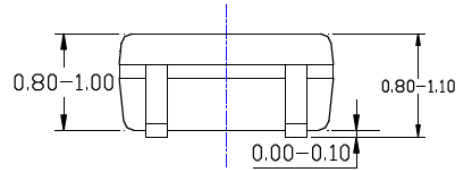
TITLE

5 LEAD SC70 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

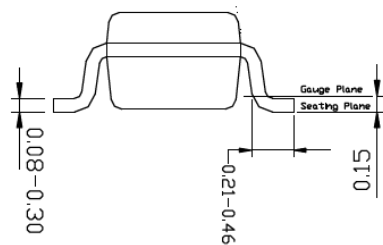
DRAWING #	SC70-5LD-PL-1	UNIT	MM
-----------	---------------	------	----



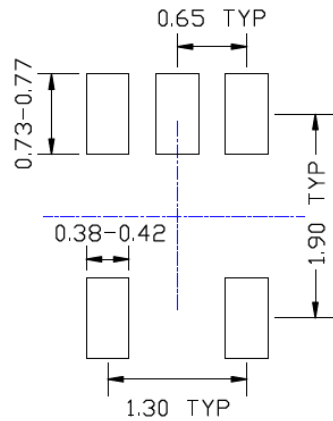
TOP VIEW



SIDE VIEW



END VIEW



RECOMMENDED LAND PATTERN

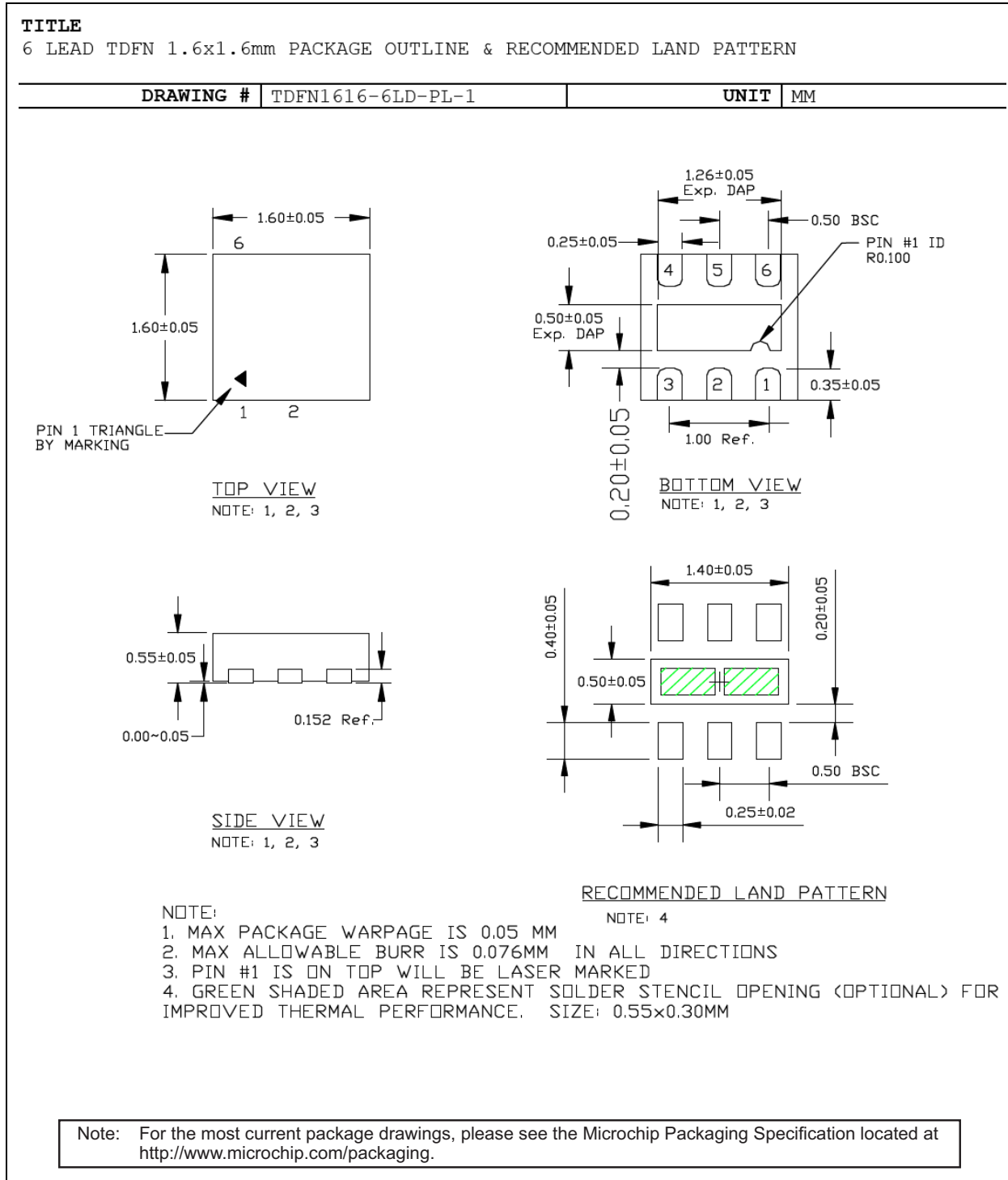
NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS ARE INCLUSIVE OF PLATING.
3. DIMENSIONS ARE EXCLUSIVE OF MOLD FLASH & METAL BURR.

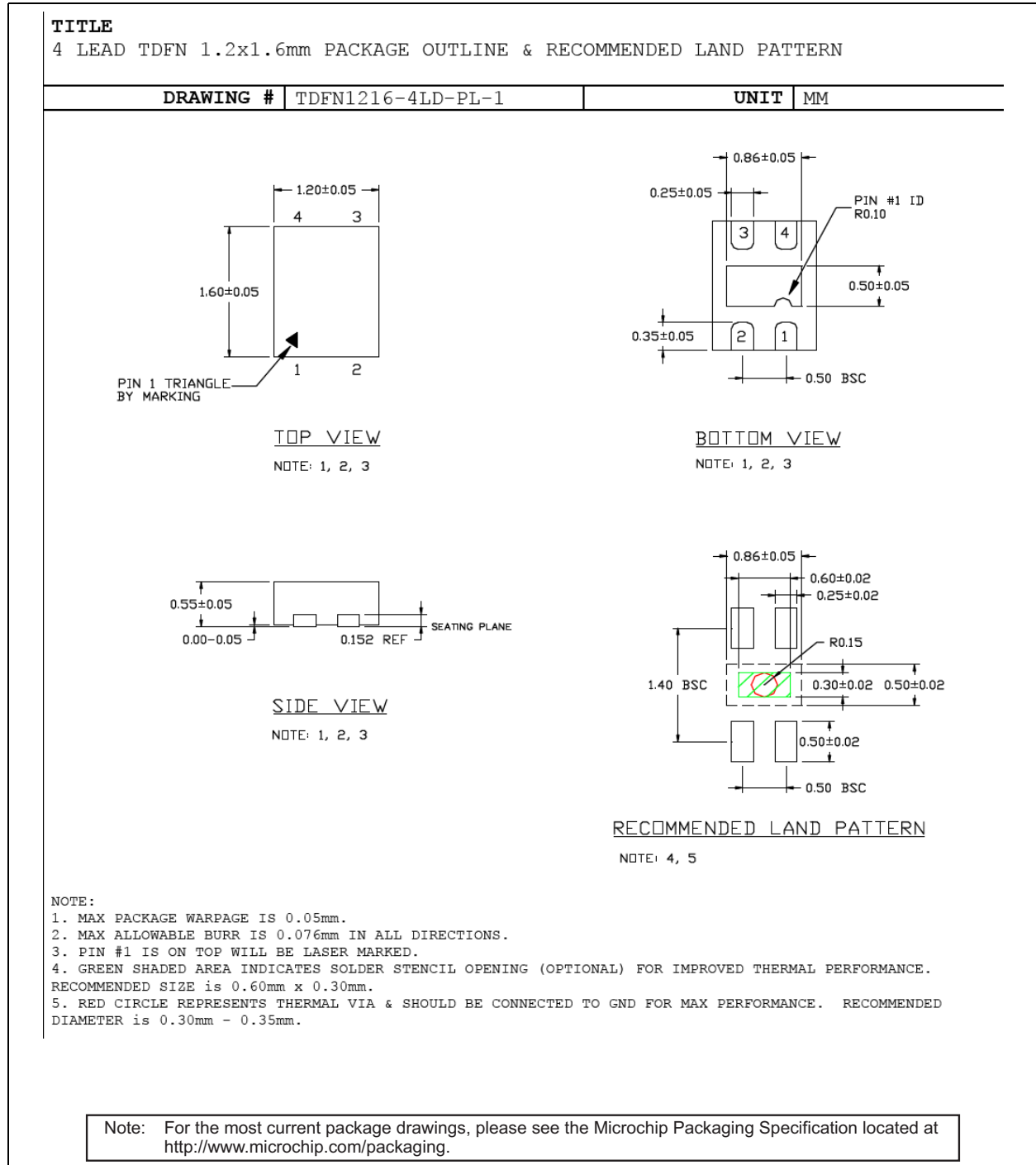
Note: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

MIC841/2

6-Lead 1.6 mm x 1.6 mm Package Outline and Recommended Land Pattern



4-Lead 1.2 mm x 1.6 mm Package Outline and Recommended Land Pattern



MIC841/2

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (April 2017)

- Converted Micrel data sheet MIC841/2 to Microchip data sheet DS20005758A.
- Minor grammatical corrections throughout.

MIC841/2

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>PART NO.</u>		<u>X</u>	<u>X</u>	<u>XX</u>	<u>-XX</u>
Device		Output Stage	Temp.	Package	Media Type
Device:	MIC841:				
	MIC842:				
Output Stage:	H =				
	L =				
	N =				
Temperature:	Y =				
Package:	C5 =				
	MT =				
	MT =				
Media Type	T5 =				
	TR =				

Examples:	
a) MIC841HYC5-T5:	Comparator with 1.25% Reference and Adjustable Hysteresis, Push-Pull, Active-Low, -40°C to +85°C Temperature Range, SC-70-5 Package, 500/Reel
b) MIC841LYMT-TR:	Comparator with 1.25% Reference and Adjustable Hysteresis, Push-Pull, Active-High, -40°C to +85°C Temperature Range, 1.6 mm x 1.6 mm TDFN Package, 5,000/Reel
c) MIC841NYC5-T5:	Comparator with 1.25% Reference and Adjustable Hysteresis, Open-Drain, Active-Low, -40°C to +85°C Temperature Range, SC-70-5 Package, 500/Reel
d) MIC842HYMT-T5:	Comparator with 1.25% Reference and Internal Fixed Hysteresis, Push-Pull, Active-Low, -40°C to +85°C Temperature Range, 1.2 mm x 1.6 mm TDFN Package, 500/Reel
e) MIC842LYC5-TR:	Comparator with 1.25% Reference and Internal Fixed Hysteresis, Push-Pull, Active-High, -40°C to +85°C Temperature Range, SC-70-5 Package, 5,000/Reel
f) MIC842NYMT-TR:	Comparator with 1.25% Reference and Internal Fixed Hysteresis, Open-Drain, Active-Low, -40°C to +85°C Temperature Range, 1.2 mm x 1.6 mm TDFN Package, 5,000/Reel

MIC841/2

NOTES:

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as “unbreakable.”

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC[®] MCUs and dsPIC[®] DSCs, KEELoc[®] code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

**QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
= ISO/TS 16949 =**

Trademarks

The Microchip name and logo, the Microchip logo, AnyRate, dsPIC, FlashFlex, flexPWR, Heldo, JukeBlox, KeeLoq, KeeLoq logo, Klear, LANCheck, LINK MD, MediaLB, MOST, MOST logo, MPLAB, OptoLyzer, PIC, PICSTART, PIC32 logo, RightTouch, SpyNIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, ETHERSYNCH, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and QUIET-WIRE are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PureSilicon, RightTouch logo, REAL ICE, Ripple Blocker, Serial Quad I/O, SQL, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademarks of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2017, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-1663-0



MICROCHIP

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon

Hong Kong
Tel: 852-2943-5100
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

China - Hong Kong SAR
Tel: 852-2943-5100
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-3326-8000
Fax: 86-21-3326-8021

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8864-2200
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

ASIA/PACIFIC

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880-3770
Fax: 81-3-6880-3771

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

France - Saint Cloud
Tel: 33-1-30-60-70-00

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7289-7561

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View MIC842NBC5 on WIN SOURCE](#)

 [Micrel Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management